MONTHLY WEATHER REVIEW.

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The MONTHLY WEATHER REVIEW summarizes the current manuscript data received from about 3,500 land stations in the United States and about 1,250 ocean vessels; it also gives the general results of the study of daily weather maps based on telegrams or cablegrams from about 200 North American and 40 European, Asiatic, and oceanic stations.

The hearty interest shown by all observers and correspondents is gratefully recognized.

Acknowledgment is also made of the specific cooperation of the following chiefs of independent, local, or governmental services: R. F. Stupart, Esq., Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Señor Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; Dr. W. N. Shaw, Director of the Meteorological Office, London; Maxwell Hall, Esq., Government Meteorologist, Kingston, Jamaica; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Habana, Cuba; Señor Luis G. y Carbonell, Director, Meteorological Service of Cuba, Habana, Cuba; Rev. José Algué, S. J., Director of the Phillipine Weather Bureau, Manila; Maj. Gen. M. A. Rykachef, Director of the Physical Central Observatory, St. Petersburg, Russia; Carl Ryder, Director, Danish Meteorological Institute, Copenhagen, Denmark.

As far as practicable the time of the seventy-fifth meridian is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

In the United States the opening days of June were unusually warm. In southern Texas and the valleys of California maximum readings were above 100° and at points in the middle and southern Plateau temperatures were higher than previously recorded for the same season of the year.

From the 2d to 6th a barometric disturbance that moved northeastward from the western portion of the Gulf of Mexico caused heavy rain in the Gulf and Atlantic States, and an area of low pressure that covered the Rocky Mountains was attended by showers from the Rockies over the central valleys and Great Lakes. West of the Rockies the rapid melting of a large accumulation of snow in the mountains caused freshets in streams.

The second week in June averaged cool in the Rocky Mountain and Plateau regions and thence over northern districts to the Atlantic coast, and temperature was above normal in the Southern and North Pacific States. At points in the Southwest maximum temperatures were above 100°, and in the interior valleys of California and Oregon they were above 90°.

Disturbances that advanced from the Plateau and Rocky Mountain districts to the St. Lawrence Valley from the 8th to 11th and 11th to 14th were attended by rain generally from the Rockies to the Atlantic, and on the 12th and 13th severe thunder, rain and windstorms caused damage in Virginia and North Carolina. Following the disturbance of the 11–14th minimum temperatures were near the freezing point in the mountain and Plateau districts of the West and in northern New England, and on the morning of the 15th a minimum of 30° and frost, for which warnings had been issued, occurred in the cranberry bogs of Wisconsin.

During the third week of June temperature was high over the Plains States and Northwest and low over the central valleys, Great Lakes, Middle Atlantic and the interior of the New England States.

From the 16th to 18th a disturbance advanced from the Northwest over the northern interior valleys to the Canadian Maritime Provinces attended by heavy rain in the Atlantic States and snow in eastern Ontario. This disturbance was followed by a cool wave that overspread districts east of the Rocky Mountains, and on the morning of the 19th temperatures as low as previously reported for the time of the year were noted in the upper Ohio Valley and the Middle Atlantic States, and light frost occurred at points in the Rockies, the Lake region, and in the cranberry district of New Jersey.

On June 19 the following special forecast was issued:

Present barometric pressures indicate that as compared with the past week the week beginning Sunday, June 20, will be warmer and drier generally in the great agricultural districts east of the Rockies.

During the week covered by this forecast high barometric pressure over the Southeast and low pressure along the northern border of the country produced prevailing southerly winds, decidedly higher temperatures, and generally clear skies east of the Rocky Mountains. In the Middle Atlantic States maximum temperatures rose each day to 90°, or above, from the 20th to 28th, and at Washington, D. C., this was the longest warm spell on record for June.

The higher upper air conditions that accompanied this warm wave are indicated by Mount Weather records for the 23d and 24th, when at elevations of 7,900 and 16,700 feet, respectively, above the station temperature was 50° on the 23d, and 32° on the 24th, and the rate of decrease in temperature was 3.3° and 2.9° per 1,000 feet. On each day the wind direction aloft and at the surface was west. On the remaining five of the seven days on which upper air observations were taken the kites attained heights that varied from 2,200 feet on the 22d to 5,500 feet on the 6th, and the average rate of temperature fall for the entire period for elevations of one mile, more or less, was 3.5° per 1,000 feet. As the average rate of fall in temperature in free air is about 3° for each 1,000 feet it will be seen that during this warm period there was about an average rate of fall to the mile level and also, on days observations were obtained, to the 1½ and 3-mile levels.

In a record of a balloon ascension made June 26 from Fitchburg, Mass., Charles J. Glidden reports that at an elevation of

2,400 feet the thermometer read 60°, with a temperature of 85° at the earth's surface. The rate of fall in this case was about 10° per 1,000 feet, or more than three times the average rate.

The conclusion to be drawn from available data is that the stagnant atmospheric condition attending periods of excessive heat extends a mile, and probably two or three miles, or more, above the earth with temperature gradients about or greater than the average, and that heated periods are due to a slowing up of atmospheric movements over a large area and a gradual superheating by the sun's rays of the stagnated air mass. Observations show also, that the termination of a heated period is indicated about two days in advance by an acceleration of the upper air currents, by a sharp decrease in upper air temperatures and by an increase in the temperature gradient at elevations of 8,000 to 10,000 feet, or more, above the earth.

During a greater portion of the month high barometric pressure over high latitudes of the North Atlantic Ocean caused a flow of exceptionally cold northerly winds over the British Isles and adjacent portions of continental Europe. On the 18th pressure began to fall over Iceland and from the 20th to 25th an area of low barometer occupied the British Isles.

During the second decade of the month low pressure over Bering Sea and high pressure over the Hawaiian Islands apparently contributed to the warm period of the third decade over the United States, and a reversal of pressure distribution over the Pacific area during the third decade was followed over the United States by a change to cooler weather during the closing days of June and the early portion of July.

Based upon changes in Atlantic and Pacific pressures the following special forecast was issued Saturday, June 26:

The warm wave that has covered the country east of the Rocky Mountains during the past week will begin to moderate Monday and the week beginning the 28th will as a whole be cooler than the preceding week.

A gradual moderation in temperature began over the eastern portion of the country on June 29 and during the early days of July temperature fell below normal over eastern and northern districts with minimum readings close to the July record in the Middle Atlantic States.

BOSTON FORECAST DISTRICT.*

[New England.]

The first half of the month was cool, and the latter half warm with excessive temperatures on several days. General rains fell on the 5–6th and 17–18th; during the balance of the month precipitation was in the form of irregularly distributed showers. No storm warnings were issued and no gales occurred on the coast.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.*

[Louisiana, Arkansas, Oklahoma, and Texas.]

Abnormally warm weather prevailed during the greater portion of the month, and rainfall was unevenly distributed, being deficient in some localities and in excess in others. The only storm of the month appeared off the mouth of the Rio Grande River on the 30th, and northeast storm warnings were ordered for the Texas coast. The storm moved westward into Mexico and reports indicate that it was the most severe that has visited the section near the mouth of the Rio Grande in several years. —*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.*

[Kentucky and Tennessee.]

The periods 6–10th and the last eight or nine days of the month were unusually warm. About the middle of the month there were several cool waves of short duration. Rainfall was in excess in eastern Kentucky and central Tennessee, and was deficient in other portions of the two States. Thunderstorms were frequent and there was some minor damage from lightning and local squalls.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.*

[Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Montana.]

No storm warnings were issued for the upper Lakes. One frost warning and two advisory warnings were sent to the cranberry marshes of Wisconsin which enabled the growers to anticipate the occurrence of frost.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.*

[Colorado, Wyoming, Utah, Arizona, and New Mexico.]

Precipitation was deficient except on the middle-eastern slope, a feature of the month being the persistency of rainfall in southeastern Wyoming, where the amount was the greatest for June of record. Special warnings were issued for high water in the Grand, Colorado, Arkansas, and Rio Grande rivers. The freshets in these streams were due to melting snow and the fluctuations followed closely changes in temperature.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.†

[California and Nevada.]

The month was one of quiet weather. The first decade was cool and the second unusually cool. The third decade was warmer, and on the 23d temperature rose to 100° in the Santa Clara Valley, and to 94° in the San Francisco Bay cities. This was the warmest day recorded for four years. It is interesting to note that a dry period, extending about seventy-six days, was broken June 17 by light rains. Such rains are unusual in June. They were forecast with precision.—*A. G. McAdie, Professor and District Forecaster.*

The following letter from Professor McAdie calls attention to a warning given to a vessel that evidently was lost because the warning was not heeded:

SAN FRANCISCO, *June* 23, 1909.

I inclose a clipping relative to the British tugboat *Grayling* and the American steamer *President*, Captain Cousins, Master. I have verified the facts in the case as far as possible and interviewed the reporter who wrote the article and who spoke directly to Captain Cousins.

I would be glad if the Chief of Bureau would give publicity to this kindly act of Captain Cousins. There are few men in command of large passenger steamers (where the minutes count and where every ton of coal is checked) who would go out of their course to give warning to a smaller vessel. It was the action of a generous and humane man. May the time speedily come when all masters will feel it incumbent upon themselves to do all they can to be of service to others under such circumstances.

The following from the San Francisco Examiner of June 20, 1909, is referred to in the above quoted letter:

The British tug *Grayling*, which sailed from British Columbia for San Francisco on the way to Ancon, is given up as lost. She sailed on May 31 and should have reached port in three days. She had only eight tons of coal on board, which in ordinary weather would last four days. The last seen of her was when passing Cape Flattery on the Sound, when she passed out two miles ahead of the steamer *President*.

Captain Cousins of the *President* saw the danger the little vessel was in, and fearing she was not aware of an approaching storm, steered to the *Grayling* and hailed her. Cousins considered her situation so precarious that he went out of his way a mile to warn her.

When alongside the *Grayling* Cousins told the skipper of the latter that the Weather Bureau had predicted a violent storm. The warning was not acted upon, and as nothing has been heard from the *Grayling* since it is believed she foundered with all on board.

RIVERS AND FLOODS.

The Missouri River continued to rise during the first three weeks of the month, and stages slightly above the flood stage were reached between Blair, Nebr., and Boonville, Mo. Heavy rains in the Black Hills regions during the latter part of May and the first decade of June resulted in general floods in all the western tributaries in the State of South Dakota, and much damage was done to mines, irrigating plants, and crops. The

* Morning forecasts made at district center; night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.